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Representation of Date and Time

NOTE: This document is a Working Draft that must be considered as "work in progress." It has not reached the stage of submission to the Environmental Data Standards Council

**This standard has been produced through the
Environmental Data Standards Council (EDSC)**

The Environmental Data Standards Council (EDSC) is a partnership among EPA, States and Tribal partners to develop and agree upon data standards for environmental information collection and exchange. The Council seeks to promote efficient sharing of environmental information between State, EPA and Tribal partners through the development of data standards. More information about the EDSC is available at www.epa.gov/edsc/.

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Foreword

The Environmental Data Standards Council (EDSC) is a partnership among EPA, States and Tribal partners to develop and agree upon data standards for environmental information collection and exchange. The Council seeks to promote efficient sharing of environmental information between State, EPA and Tribal partners through the development of data standards. More information about the EDSC is available on the EDSC website at www.epa.gov/edsc/.

The Council identifies, prioritizes and pursues those areas where information exchange standards will provide the most value in achieving environmental results. The Council involves Tribes and Tribal Nations, and other state and federal agencies in the development of the standards and then provides the draft materials for general review. Business groups, non-governmental organizations, and other interested parties may then provide input and comment for Council consideration and standard finalization.

Introduction

Environmental information is a key tool in the effective management of our environmental resources and human health conditions. As a result, much effort goes into data acquisition, management, maintenance, exchange, and oversight. Greater access is the goal of many data consumers, and data managers. Providers invest significant resources meeting their requirements. In response, many data providers are improving access as they post usable copies of their environmental information on the web. These efforts are a vast improvement over previous conditions; however, there is a growing desire and need to both provide and receive data in a clearly defined and a uniform way. Data from multiple sources can then be aggregated and used without the inherent variations that exist between data sets across agencies.

Data exchange standards have been in place for years, e.g., health care, UPC codes for commodities, etc. The Representation of Date and Time Standard is the next step to improve the exchange of environmental data across the nation. Implementers of the standard will map their own data to the nomenclature specified in the standard and develop the translation/export scripts. Once done, extractions and exchanges become routine, and no changes to their parent data management systems will be necessary.

Implementation of the standard will require some short-term investment as discussed, however there will be short and longer-term benefits for users. These include:

- Data quality improvement—data that are being exchanged will be evaluated by the sender and the recipient—data issues will be discovered and corrected;
- Human intervention in the interchange of information machine-to-machine environments is reduced;
- Rework is reduced—cleaner data require less maintenance and correction;
- Public resources are conserved—if access is reliable and fast, data collected by another organization can help others meet their mission requirements;
- Data analyses and resulting decisions are aided by a broader information resource base when data from others can be aggregated without significant manipulation;
- Standards will be augmented as participation grows and needs expand;
- Time required to specify and complete data exchange agreements is reduced; and
- Data management and transactional costs are reduced.

1. Scope

This EDSC standard describes data elements and data blocks that are used to exchange date and time data and information.

This EDSC standard is applicable to:

- cataloguing and exchanging information about date and time

This EDSC standard defines:

- data elements that describe date and time

2. Normative References

This standard relies on other standards to make it complete and provide the necessary support. As such users should consider the Normative Standards (references) noted below, integral to the Representation of Date and Time Standard. These include:

- ISO 8601:2000 Data elements and interchange formats -- Information interchange -- Representation of dates and times
- ANSI INCITS 30-1997 Data elements and interchange formats -- Information interchange -- Representation of dates and times
- ANSI INCITS 310-1998 Data elements and interchange formats -- Information interchange -- Representation of dates and times

3. Terms and Definitions

For the purposes of this document, the following terms and definitions apply:

3.1

civil time

The time defined in a region by the civil authorities there, adjusted for Daylight Saving Time, if appropriate.

3.2

coordinated universal time (UTC)

“The official coordinate time scale for the Earth defined on the rotating geoid.” [Rec.ITU-R TF.1010, Relativistic Effects in a Coordinate Time System in the Vicinity of the Earth]. “The time scale, maintained by the Bureau International des Poids et Mesures (BIPM), and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals” [Rec 686, Glossary].

3.3

data block

a grouping of related Data Elements that can be used and reused among different information flows.

[source: Core Reference Model draft (version 1.0)]

An example Data Block is Address Identification, which includes the component Data Elements such as City Name, State Name, and Zip Code.

3.4

data element

a single unit of data that cannot be divided and still has useful meaning.

[source: Core Reference Model draft (version 1.0)]

Example Data Elements are individual components of an Address, such as City Name, and Zip Code.

3.5

date

A particular day within a Gregorian calendar month.

3.6

Daylight Saving Time

An instant in civil time represented with an adjustment specified by the Uniform Time Act of 1965, as amended: “During the period commencing at 2 a.m. on the first Sunday in April of each year and ending

at 2 a.m. on the last Sunday in October, the standard time is advanced one hour except in those states that have by law exempted themselves from observance of advanced time.”

Note: ‘standard time’ as used in this quotation is taken to refer to civil time for the purposes of this standard.

3.7

designated civil time

A time whose representation is independent of all time differentials from UTC.

Example: 9 o'clock in the morning civil time in any time zone, adjusted for Daylight Savings Time, if appropriate.

3.8

time

“In English ‘time’ is used to specify an instant (time of day) ” [*ITU-R Recommendations, 1994 TF Series Volume, Time Signals and Frequency Standards Emissions* (Recommendation 686, Glossary)]. A particular point in the stream of time at a particular place (which may or may not be specified in terms of a particular date): a specific hour, or minute, or second, or fraction of a second in a day at a specific place.

4 Date and Time

4.1 Date/Time Data Blocks and Data Elements

This standard specifies data blocks and data elements that may be used to specify date and time. Table 1 specifies the data elements.

Table 1 – Date/Time Data Blocks and Data Elements

Date/Time Data Standard –			
Data Element Name	Data Element Definition	Notes	Format
1. Date - Data Elements			
<p><i>Definition:</i> A particular year, month, and day of the Gregorian calendar</p> <p>Calendar date data is represented as an eight-digit sequence, composed of numeric characters in the format YYYYMMDD, where</p> <ul style="list-style-type: none"> YYYY represents the calendar year, MM represents the calendar month of the year, and DD represents the calendar day of the month, sequenced from high order to low order (i.e. year, month, day, from left to right, as shown above). <p>No separators are used between the elements for the interchange of date.</p>			
1.1 Year Code	A code representing a particular year according to the Gregorian calendar	The numbers that represent month of year shall include leading zeros whenever their respective values contain are less than 1000.	YYYY Numeric (4)
1.2 Month Code	A code representing a particular month within a Gregorian calendar year.	The beginning of a month within a year shall be represented by a two-digit decimal number ranging from 01 through 12. The numbers that represent month of year shall include leading zeros whenever their respective values contain only one digit.	MM Numeric (2)
1.3 Day Code	A code representing a particular day within a Gregorian calendar month.	The beginning of a day within a month shall be represented by a two-digit decimal number ranging from 01 through 31 depending upon the number of	DD Numeric (2)

Date/Time Data Standard –**Date**

Definition: the representation of dates in the Gregorian calendar and times and representations of periods of time.

Data Element Name	Data Element Definition	Notes	Format
		days in the month. The numbers that represent day of the month shall include leading zeros whenever their respective values contain only one digit.	

2. Time - Data Elements

Definition: A particular point in the stream of time at a particular place (which may or may not be specified in terms of a particular date): a specific hour, or minute, or second in a day at a specific place.

Calendar date data is represented as an eight-digit sequence, composed of six numeric characters followed by three alphabetic characters in the format

HHMMSSZZZ.

where

HH represents the hour

MM represents the minute

SS represents the second

ZZZ represents the time zone

No separators are used between the elements for the interchange of time.

2.1 Hour Code	A code representing sixty minutes, each labeled consecutively in the 24-hour timekeeping system from 0 through 23 beginning with the start of the first minute after the beginning of the hour. Ordinarily, an hour is one twenty-fourth of a day.	The beginning of an hour of day shall be represented using the 24 hour timekeeping system by recording a two-digit decimal number ranging from 00 through 23. The numbers that represent hour shall include leading zeros whenever their respective values contain only one digit. See Note 1	HH Numeric (2)
2.2 Minute Code	A code representing sixty seconds, each labeled consecutively in the 24-hour timekeeping system from 0 through 59 beginning with the start of the first second after the beginning of the minute. Ordinarily,	The beginning of a minute within an hour of the day shall be represented by a two-digit decimal number ranging from 00 through 59. The numbers that represent minute shall include leading zeros whenever their respective values	MM Numeric (2)

Date/Time Data Standard –			
Date			
<i>Definition:</i> the representation of dates in the Gregorian calendar and times and representations of periods of time.			
Data Element Name	Data Element Definition	Notes	Format
	a minute is one-sixtieth of an hour.	contain only one digit. See Note 2	
2.3 Second Code	Ordinarily, a code representing second is one-sixtieth of a minute. See Note 5	The allowable two-digit decimal numbers for seconds ordinarily range from 00 through 59. The numbers that represent second shall include leading zeros whenever their respective values contain only one digit. See Note 3	SS Numeric (2)
2.4 Time Zone Designator Code	A code representing a geographical region within which the same standard time is used.	The allowable three alphabetic character codes are listed in: Table 2 – Time zone references for U.S. Standard time zones Table 3 – Time zone references for U.S. daylight time zones	Alphabetic (3)

Note 1: an hour which contains a leap second will have one extra or one less second, depending upon whether the leap second is positive or negative, respectively.

Note 2 : a minute which contains a leap second will have 61 or 59 seconds, depending upon whether the leap second is positive or negative, respectively.

Note 3 : the two-digit decimal number 60 is reserved for representing a positive leap second. The allowed two-digit decimal numbers range from 00 to only 58 in the last minute of a day having a negative leap second. A leap second is a second of time intentionally inserted in or deleted from the UTC time stream to keep it approximately compatible with the rotation of the Earth . An inserted second is called a *positive leap second* and an omitted second is called a *negative leap second*. For the purposes of this standard, a positive leap second is labeled "60" and a negative leap second is labeled "58" (there being no second with the label "59" in a minute with a negative leap second).

Note 4: LIMS systems may be recording time with leap seconds if the LIMS is receiving time from the atomic clock at NIST or the Naval Observatory.

Note 5: A code representing "the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium atom-133." (XIII^e Conference Générale des Poids et Mesures, 1967).

4.2 U.S. Time Zone Designator Codes

4.2.1 Standard Time Zones in the United States

Representation of Standard time zones in the United States are shown in table 2. This table gives the name of each standard time zone in the United States and its territories, together with its representational code.

Table 2- Time zone references for U.S. Standard time zones

Time zone designator code	Standard time zone name
AST	Atlantic Standard Time
EST	Eastern Standard Time
CST	Central Standard Time
MST	Mountain Standard Time
PST	Pacific Standard Time
KST	Alaska Standard Time
HST	Hawaii-Aleutian Standard Time
SST	Samoa Standard Time

4.2.2 Daylight Saving Time in the United States

In accordance with the Uniform Time Act of 1965, as amended, “During the period commencing at 2 a.m. on the first Sunday in April of each year and ending at 2 a.m. on the last Sunday in October, the civil time is advanced one hour except in those states that have by law exempted themselves from observance of advanced time.” This advanced time is commonly referred to as “Daylight” or “Daylight Saving” time.

Table 3 gives the name of each daylight time zone in the United States and its territories, together with its representational code.

Table 3 - Time zone references for U.S. Daylight Savings time zones

Time zone designator code	Daylight time zone name
ADT	Atlantic Daylight Time
EDT	Eastern Daylight Time
CDT	Central Daylight Time
MDT	Mountain Daylight Time
PDT	Pacific Daylight Time
KDT	Alaska Daylight Time
HDT	Hawaii-Aleutian Daylight Time
SDT	Samoa Daylight Time